



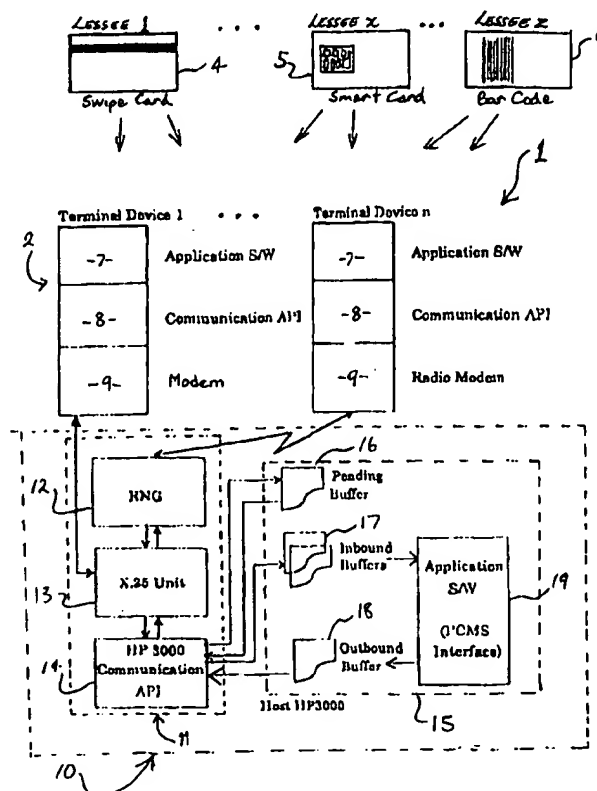
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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## (54) Title: LEASE EQUIPMENT TRACKING AND ACCOUNTING SYSTEM

## (57) Abstract

A lease equipment and tracking system (1) comprising a plurality of equipment available for lease from a lessor to any one or more of a plurality of lessees, including mobile lessees and static lessees, each mobile lessee having an identification device (4, 5, 6) unique thereto and identifying the mobile lessee, each static lessee including at least one terminal unit (2) identifying the static lessee and configured to read (24) the identification devices (4, 5, 6), wherein upon transfer of the equipment from a mobile lessee to a static lessee or vice versa, the identification device (4, 5, 6) is read by the terminal unit (2), which communicates details of the transfer to a host computer (10) via a communication channel (88, 89, 90, 11), the host computer (15) recording and validating the transfer and accounting for lease charges of the equipment for each of the mobile lessee and the static lessee.



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## LEASE EQUIPMENT TRACKING AND ACCOUNTING SYSTEM

### Field of the Invention

The present invention relates to automated systems for distributed activities and, in particular, discloses an arrangement by which effective accounting of those  
5 activities can be made.

### Background Art

There are many instances in commerce which entail the hire or lease of equipment, which for the purposes of this specification are considered to be synonymous, and a consequential need to properly account for such activities. Where  
10 the activities are localised, there is no difficulty in accounting for the activity by virtue of the leased equipment often being collected and returned from a single location. This, for example, occurs in relation to the leasing of builder's equipment where, for example, a tradesperson will collect an item of equipment one day and, after use of that item, return the item to the same depot at some later time. The cost of the lease can be  
15 readily determined because the depot can maintain clear records as to when the equipment was taken on lease and returned from lease. Generally, the lease is undertaken on an hourly or daily rate.

However, difficulties arise where the equipment being leased is such that it may be transferred from a number of different lessees from time to time and, in some  
20 cases, need never be returned to the lessor. One example of such equipment includes pallets used for the transportation of goods and materials. Typically, the pallets are owned by an entity and then leased to an initial user. However, the initial user is not bound to return the used pallets to the lessor but in turn can transfer those pallets, together with the initial user's goods, to another (second) user. The second user having  
25 then taken possession of the pallets can then transfer the pallets to another (third) user together with appropriate goods. In each instance, the lease fee to be paid by each user to the lessor is based upon the amount of time that user has the pallets in its possession. Difficulties with this system arise in that it is quite common for user's to dispute the length of time any one or more pallets were in their possession and hence the amount of

lease charges that should be paid. Further, as often happens with highly mobile equipment, it is not uncommon for pallets to be "lost" and for the lessor to charge the last known user with the replacement cost of the pallet. Where disputes arise as to who, and at what time, was a lessee of the pallet, that dispute can clearly escalate if it is subsequently determined that the pallet has been "lost". Further, more often than not, such pallets are not actually "lost", but rather their transfer from one user to another is incorrectly recorded, and hence it is common for one user to be charged for the replacement cost of a pallet, whilst simultaneously another user is charged excess hire fees for the same pallet. This is clearly an undesirable circumstance both from the point of view of the lessees (users) who invariably pay for an inaccurate service, and the lessor, who is desirous of providing a more reliable service to its customers.

### Summary of the Invention

In accordance with one aspect of the present invention there is disclosed a lease equipment and tracking system comprising a plurality of equipment available for lease from a lessor to any one or more of a plurality of lessees, including mobile lessees and static lessees, each mobile lessee having an identification device unique thereto and identifying the mobile lessee, each static lessee including at least one terminal unit identifying the static lessee and configured to read the identification devices, wherein upon transfer of the equipment from a mobile lessee to a static lessee or vice versa, the identification device is read by the terminal unit, which communicates details of the transfer to a host computer via a communication channel, the host computer recording and validating the transfer and accounting for lease charges of the equipment for each of the mobile lessee and the static lessee. Other aspects of the invention are also disclosed.

### Brief Description of the Drawings

A number of embodiments of the present invention will now be described with reference to the drawings in which:

Fig. 1 is a schematic block diagram representation of a leasing and accounting system of the preferred embodiment;

Fig. 2 is a schematic block diagram representation of a compact terminal unit useful in the preferred embodiment;

Fig. 3 is a schematic block diagram representation of a portable (cellular modem) terminal unit useful with the preferred embodiment;

5 Fig. 4 is a schematic block diagram representation of a portable (radio modem) terminal unit and an associated base station useful in the preferred embodiment;

Fig. 5 is a schematic block diagram representation of a fixed high-end terminal unit useful in the preferred embodiment;

Fig. 6 depicts a system overview in which WOMBAT represents an HP3000  
10 computer system of an exemplary embodiment;

Figs. 7 and 8 illustrate data flow within the HP3000 computer of Fig. 6;

Fig. 9 depicts data flow for a Transaction Posting operation in the system of Fig. 8; and

Fig. 10 illustrates modules within the Transaction Posting program.

15

### Detailed Description

Fig. 1 shows a leasing and accounting system 1 for pallets used in product transportation which includes a plurality of terminal devices 2(1)...2(n) that are distributed at locations where pallets are transferred to/from one lessee to another lessee, or to/from the lessor. For example, such a location can include a grocery  
20 distribution warehouse, a rail depot, a manufacturing location or a consumer location, to name but a few. In each case, each terminal device 2 is allocated to a particular user of the system 1 who at any time can take over the lease of, or re-lease, one or more pallets. Associated with each terminal device 2 is a user account code for which an account for the lease of pallets, for example on a monthly basis, is raised. Depending  
25 on the particular circumstance, a number of terminal devices 2 may be associated with the same account code, whether or not they may be used at a single or a number of different locations.

Whilst the terminal devices 2 relate to a "static" lessees, in the sense of lessees who do business from specific locations, the system 1 can also include a number of

mobile lessees, (eg: Lessee 1...Lessee 2) each of which is provided with an individualised data identification device such as a swipe card 4 including a data encoded magnetic stripe 4a, a smart card 5 including data encoded semi-conductor memory 5a, or a bar code identifier card 6 including a bar code 6a. Each of the cards 4, 5 and 6  
5 can be carried, for example, by mobile lessees such as truck drivers and the like who receive goods and pallets from a depot and transport those goods and pallets, for example, to another depot. In particular, each of the cards 4, 5 and 6 may include information identifying the particular mobile lessee (truck driver) and, where appropriate, whether or not that operator is an individual account holder within the  
10 system 1, or alternatively whether that operator is part of a larger account holder, for example a truck driver employed or otherwise engaged by a road freight company.

As seen in Fig. 1, each of the terminal devices 2 include application software 7 that allows reading of the appropriate card 4, 5 or 6 and recordal of the time of transfer together with old and new lessee details, and any details of the transaction entered  
15 manually via the terminal device, including the number of pallets being transferred from the mobile operator to the depot, or vice versa. The terminal devices 2 further include communication application software and a modem 9, where the application software 7 interfaces with the communication application software 8 to enable bi-directional communications via the modem 9 to a computing system 10 operated by the  
20 lessor.

As seen in Fig. 1, the computer system 10 includes a communications interface 11 which includes a radio network gateway (RNG) 12 for radio modem communications with the terminal devices 2, and an X.25 unit 13 for telephone line modem communications with the terminals 2 and also the RNG 12. These devices  
25 interface through a communications dedicated computer 14 which interfaces to a host computer 15 which incorporates a pending buffer 16, an inbound buffer 17, an outbound buffer 18 and application software 19. In some embodiments, the functions of the computers 11 and 15 can be performed by a single computer.

When a transaction takes place, for example a swipe card 4 of a truck driver is swiped through an appropriate reader (not seen in Fig. 1) of one terminal device 2, and the number of pallets are entered. The terminal device 2 then sends transaction information to the host computer 15. The host computer 15, via the application software 19, validates the transaction automatically accounting for the transfer of pallets either to or from the truck driver.

The operation of the system 1, in a variety of configurations, can now be discussed with reference to Figs. 2 to 5, where it is noted that like reference numbers are used to identify components having similar or corresponding functions.

Fig. 2 illustrates a compact terminal unit 20 that includes a controlling processor 21 connected to a keyboard 22, a display 23 and a memory unit 27. The unit 20 further includes a card reader 24 configured to read either one of a swipe card 4 or a smart card 5 as desired and thus is arranged to extract details regarding mobile operators from the corresponding data identification device. During a transaction, after the card 4 or 5 is read, the operator of the unit 20 can enter the number of pallets transferred into the keyboard 22 and verify such information using the display 23. Using an integrated telephone line connectable modem 25 connected to the processor 21, the terminal unit 20 transmits a validation request via a telephone line 26 of a public switched telephone network (PSTN) to the computer system 10 of Fig. 1. The internal memory 27 is configured for the retention of controlling programs in ROM and also variable data in RAM. As illustrated, the terminal unit 20 also includes a connection 28 permitting interconnection to a printer (not illustrated) for hard copy reproduction of transaction information such as a receipt that may be given to the mobile operator, and also a connector 29 for connection to a bar code reader (not illustrated). The terminal unit 20 is powered directly from AC mains supply 30 and would typically be used at locations where low volumes of pallets pass through on a daily basis. The processor 21 also connects to a loudspeaker 31 which provides audible feedback to the operator of the terminal unit 20 particularly during data entry via the keyboard 22.

Fig. 3 shows a portable, hand-held, terminal unit 40 which is powered by an internal rechargeable battery supply 43. In other respects, the terminal unit 40 is substantially similar to the terminal unit 20 excepting that the telephone modem 25 of the arrangement of Fig. 2 is, in this embodiment, replaced by a cellular radio  
5 modem 41 and an associated antenna 42. With such an arrangement, the cellular modem 41 enables interconnection with the computer system 10 via a public cellular radio telephone network and in this manner provides for use in remote locations or in circumstances where moderate volumes of use require portability but not expenses associated with fixed location systems.

10 Fig. 4 illustrates an arrangement intended for use at large distribution warehouses that exhibit high volumes of traffic from a large number of trucks, often simultaneously. In such an arrangement, a number of receiving persons employed at the warehouse would each be provided with a portable terminal unit 50, configured in a manner not unlike the unit 40, but in this case using a radio modem 51 and associated  
15 antenna 52 configured for direct radio communications with a base station 60 configured at or within the warehouse. Thus, the radio modem 51 need not be configured to operate with a cellular public telephone network, but can be arranged to operate on a less expensive dedicated short range (private) network associated only with the particular warehouse. The base station 60 includes a multiple radio frequency  
20 transceiving modem 67 and associated antenna 68 configured to simultaneously receive radio frequency signals from one or more of the portable terminal units 50. The radio frequency communication signals are buffered via a communications adaptor 66 under control of a controlling processor 61 to a telephone modem 25 connected to the host computer 15 via a telephone line 26.

25 The base station 60 can be configured within a stand-alone personal computer and can be provided with a keyboard 62, connected to a printer 63, internal memory 64 and a display screen 65. The processor 61 may be configured in concert with the memory 64, to buffer simultaneous transmissions from the units 50 into a queue for transmission to the host computer 15.



Fig. 5 shows a fixed high-end terminal unit 70 configured in a manner not unlike the base station 60 but without the RF communication capabilities. Instead, a card reader 71 configured to read either one or both of a swipe card 4 or smart card 5 is provided and also a bar code reader 72 is also provided. In this manner, the terminal unit 70 is able to read any type of card used within the system 1 and can be used as an alternative to the compact terminal unit 20.

It will further be appreciated that in some systems, the individualised data identification device may be formed by a combination of swipe, smart and bar code cards.

The application software 19 is configured to record all pallet transactions to and from all customers of the lessor. Importantly, for each transaction, the date and time of transaction is recorded so that appropriate charges can be determined based upon the number of pallets in the possession of any lessee at any one time. In this fashion, the software 19 maintains a running tally of the total number of pallets in possession by each lessee and, where the lessee may be distributed throughout a number of locations, the number of pallets at any one location.

In this manner, the application software 19 can produce periodical statements of account for each lessee representing that person's liability to the lessor. Further, because at each transaction the number of pallets is accurately recorded, the system effectively eliminates the "loss" of pallets from the system. Further, by recording transaction details in the application software 19, consignment details of particular loads can be recorded and the system can also provide electronic proof of delivery of product, thus enhancing the service provided by the lessor to the lessees.

Figs. 6 to 10 depict an exemplary embodiment of the present invention based on the embodiment of Figs. 1 to 5. Fig. 6 shows a system overview in which WOMBAT represents an HP3000 computer system 87 combining the functions of the computers 14 and 15 described above. In particular, in Fig. 6 the communications data can be received from the terminal devices 2 as any one of mobile (cellular) 81, voice data 82 supplied via a land line based telephone network or as privately operated

communications 83. In each case, the data 81, 82 and 83 is transferred to one of a number of nodes 84, 85 and 86 respectively which convert the communications data into packet switched data for communication using X.25 protocols direct to the computer system 87 via connections 88 and 89 or alternatively via a packet switched  
5 network such as AUSPAC 90.

Figs. 7 and 8 illustrate data flow within the HP3000 computer system of Fig. 6 and in particular the buffering of data on input, it's distribution to and processing in various programming modules (CTRn), and it's transfer to appropriate output buffers and then return of data for action. As seen in Fig. 7 each of the data inputs sourced  
10 from communications channels 84, 89 and 90 are supplied to respective communication receiving ports 91, 92 and 93. Data from the input ports 91-93 is then transferred to an input buffer 94 which forms an input to a software module CWST1 which acts to identify the type of data that has been received and to distribute the data to one of five record buffers 96, 97, 98, 99 and 100. Each of the record buffers 96-100 provides a  
15 virtual input storage for a corresponding software module which, as illustrated includes card validation 101, the sending of consignment notes 102, the loading of consignment notes 103, the creation of an end of shift report 104, and a maintenance procedure 105.

Turning now to Fig. 8, it is seen that each of the software applications 101-105 couple their processed outputs to at least one, but generally two of five destinations,  
20 three of which being output buffers 106, 107 and 108 that are coupled to the communications modules 91, 92 and 93 respectively to return communications data to the terminal devices 2 via the communication links. As also seen, the loading of consignment notes module 103 also outputs to a posting module 109 which posts the consignment details sought by the various terminal devices to permit for off-line  
25 processing by a software module 110 causing a batch report 111 to be created for review and inspection by the lessor.

As also seen in Fig. 8, the card validation module 101 and the end of shift module 104 each output to an end of shift buffer 112 for End Of Shift processing. The buffer 112 applies the data to a report module 113 which returns a facsimile

message 114 to each lessee depot summarising transactions made during the shift just concluded. In this manner, each customer can, at the conclusion of a shift, receive a full report of all transactions that have taken during the course of the shift. That transaction report can be used to track goods as well as particulars drivers and may be  
5 used to provide a quantitative assessment of the efficiency of a transport and distribution network.

Fig. 9 depicts data flow for a Transaction Posting operation in the system of Fig. 8 sourced from processing module CTR03 and using processing module CTR50 and the maintenance of a PCMS database 120. As seen in Fig. 9, batch report output  
10 from the software module 110 can provide a fax message 115 of system overview information. Similarly, the information can be transferred to an inventory database 116 to provide an update of the type of goods and their quantity being transported at any one time. Importantly however, the software module 110 outputs to buffer  
modules 117, 118 and 119 each of which provide for pre-processing of consignment  
15 information prior to storage in the PCMS database 120. In particular, module 117 maintains a record of the issuing and de-hiring of pallets into the system from/to the lessor. Module 118 accounts for the re-location of pallets whilst those pallets remain within the hire of a single lessee in the system. For example, module 118 would apply to a transport distribution company which may receive goods from one supplier and  
20 then transfer those goods to a destination via a number of the transport company's depots at various locations. At each of those depots, the re-location of the pallets, and their goods, may be recorded although the actual lessee of the pallets does not change. The software module 119 accounts for the transfer of pallets between various lessees and also accounts for any goods carried thereby. In this fashion, the PCMS  
25 database 120 may be configured to retain a range of data regarding the movement of goods and pallets throughout a transportation network of various lessees and lessee locations thus permitting the accounting for time of hire of each of the pallets by any one lessee. Similarly, movement of goods may be tracked merely by noting the most recent location of the goods recorded in the database.

Fig. 10 illustrates modules within the Transaction Posting program 110 generally designated CTR50 in Fig. 9. The first step of the transaction posting program 110 step 121 which matches the consignment notes to any previous notes. Where there is no match, indicated by connection 127, each of the parties associated with the consignment is informed at step 123. If there is a match, step 122 is processed which checks that the equipment being carried is the same with that on the consignment note. If there is a difference again, the parties are informed at step 123. In either event, control from steps 122 and 123 is passed to step 124 which adjusts the balance by the account of the transport operator. Where the consignment notice has originated, for example from a manufacturing location, thus relating to a first dispatch of the consignment, step 121 jumps directly to step 124 to adjust the balance by the account. In step 125, the total balance of the relieving lessee and the acquiring lessee is checked against previous balances to ensure there is an appropriate matching up of the total number of pallets associated with the transfer.

The system 1 provides a number of advantages arising from real-time communication between a large number of dispersed locations and a central processing location. Those advantages include electronic linking of the lessor to the lessee and effective product tracking and associated ancillary benefits such as delivery enquiries, proof of delivery and electronic invoicing. A further benefit to customers of such an arrangement is that it provides an assessment of the performance of a transporter, such as the time taken to transport a load and, where appropriate, because often freight carriers can transport goods to many locations on one run, the route followed.

In a further extension of the above arrangement, individual pallets can be tracked by associating with each pallet an appropriate identifier, such as a bar code or electronically encoded device able to be interrogated. Such an arrangement can be used for relatively expensive equipments such as injection moulded plastic pallets and goods generally carried thereby.

The foregoing describes only a number of embodiments of the present invention and modifications, obvious to those skilled in the art can be made thereto without departing from the scope of the present invention.

**CLAIMS:**

1. A lease equipment and tracking system comprising a plurality of equipment available for lease from a lessor to any one or more of a plurality of lessees, including  
5 mobile lessees and static lessees, each mobile lessee having an identification device unique thereto and identifying the mobile lessee, each static lessee including at least one terminal unit identifying the static lessee and configured to read the identification devices, wherein upon transfer of the equipment from a mobile lessee to a static lessee or vice versa, the identification device is read by the terminal unit, which  
10 communicates details of the transfer to a host computer via a communication channel, the host computer recording and validating the transfer and accounting for lease charges of the equipment for each of the mobile lessee and the static lessee.
2. A system according to claim 1, wherein said identification devices each  
15 comprise a card including a readable structure provided thereon, said structure incorporating data identifying the corresponding mobile lessee.
3. A system according to claim 2, wherein said structure is selected from the group consisting of a bar code, a magnetically encoded strip, and a semiconductor  
20 memory.
4. A system according to claim 2, wherein said data comprises a mobile lessee identifier and a mobile operator identifier, wherein a plurality of said identification devices include the same mobile lessee identifier whilst said mobile operator identifier  
25 is unique to a particular operator within said system.
5. A system according to claim 1, further comprising communication means for linking said terminal units to said host computer.

6. A system according to claim 5, wherein said terminal units each comprise a reader for reading data from one of said identification devices, input means for manually entering details of a transfer associated with the corresponding identification device and a communication unit for coupling communications data to said communication means.

7. A system according to claim 6, wherein said communication unit comprises a modem connectable to a public switch telephone network forming said communication means.

8. A system according to claim 6, wherein said communications unit comprises a cellular radio modem and said communications means comprises a cellular radio network forming part of a public switched telephone network.

9. A system according to claim 6, wherein said communications unit comprises a radio frequency transceiver for coupling communications signals to a base station having a complementary transceiver and connectable to said host computer via said communications means.

10. A system according to any one of claims 6 to 9, wherein said terminal unit further comprises a display for displaying transaction details.

11. A system according to any one of claims 6 to 10, wherein said terminal unit further comprises a printer for printing details of a transaction.

12. A system according to any one of claims 6 to 11, wherein said terminal device is a portable-hand-held device.

13. A lease equipment and tracking system comprising:

a plurality of transportation pallets intended for the transportation of goods between locations and owned by a lessor and leased to one or more lessees;

at least one identification card carried by a transport operator whom transports said pallets between locations, said card identifying one of said lessees to whom said  
5 pallets are leased whilst in possession of said one lessee;

at least one terminal unit arranged at one of said locations and via which said identification card can be read on transfer of said pallets from the transport operator to said location, or vice versa, wherein transaction details including the number of pallets being transferred are entered via said terminal unit to maintain a record of transfer of  
10 said number from said one lessee;

means for communicating said transaction details to a host computer operated for the benefit of the lessor by which using said transaction details an account of lease of said number of pallets is producible for the one lessee.

15 14. A system according to claim 13 wherein said one location is associated with another lessee and identifiable via said terminal unit, and said transaction details comprise identification data of each of said lessees and the number of pallets transferred between said lessees.



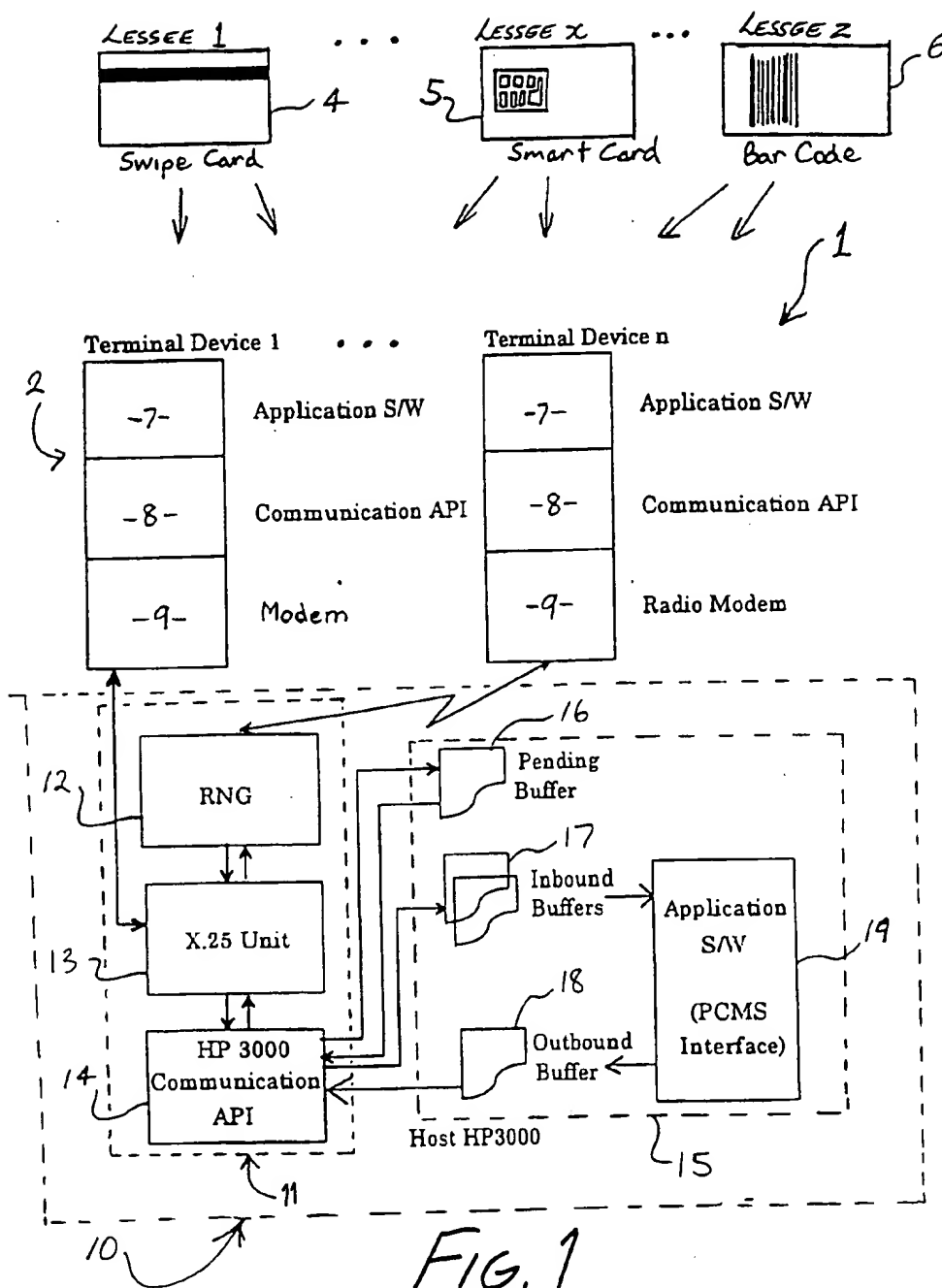


FIG. 1

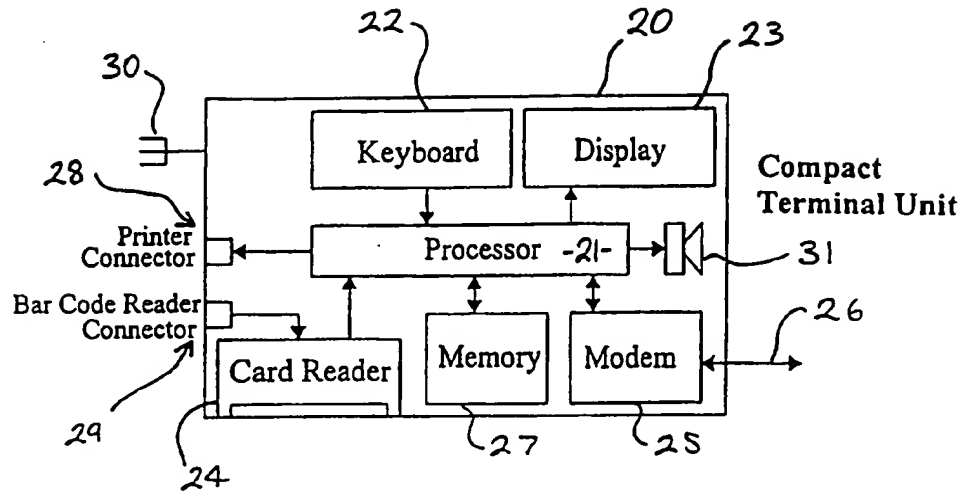


Fig. 2

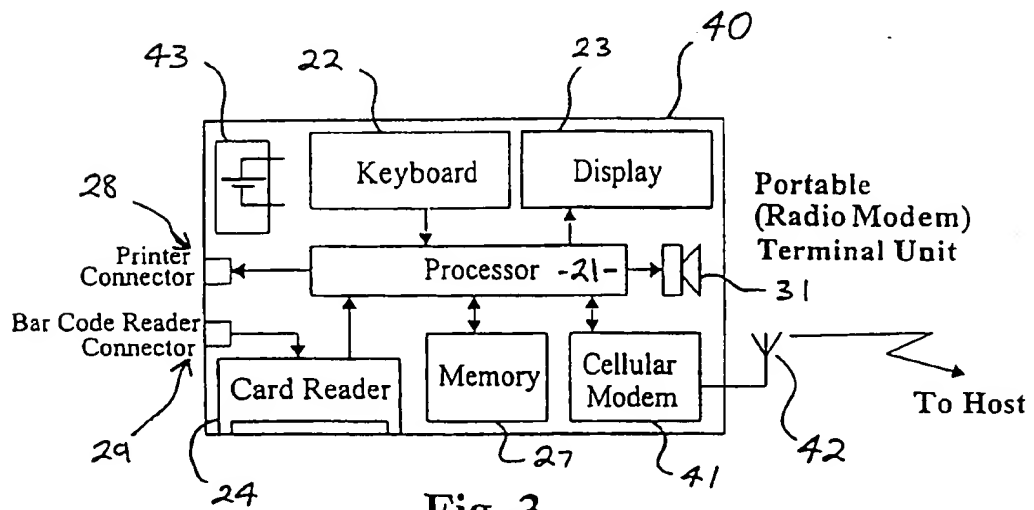


Fig. 3

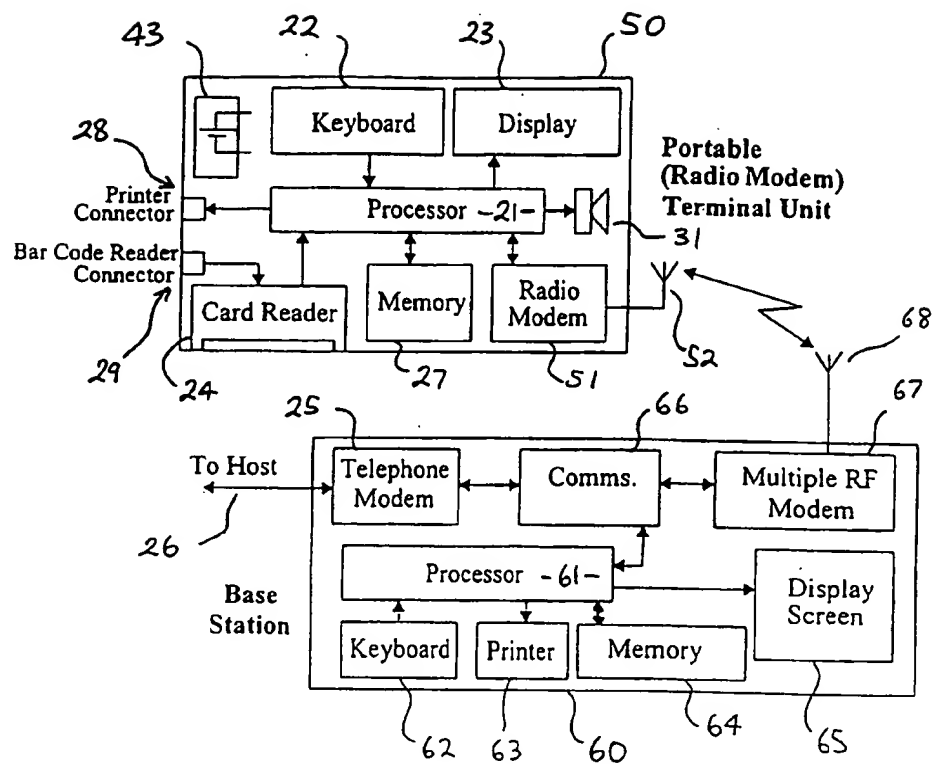


Fig. 4

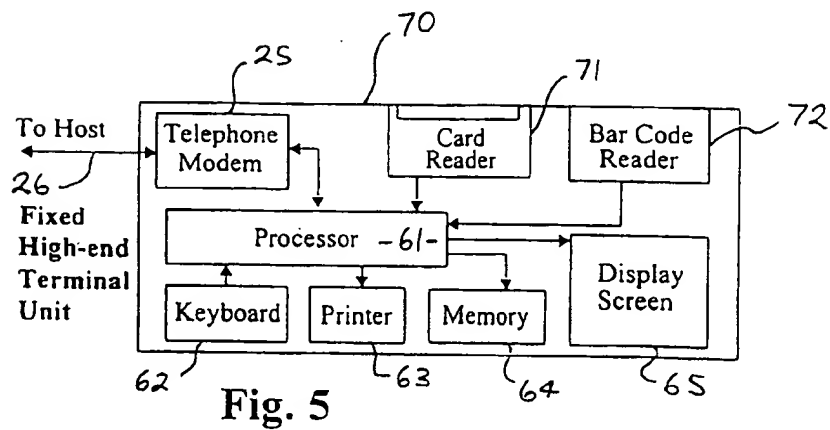
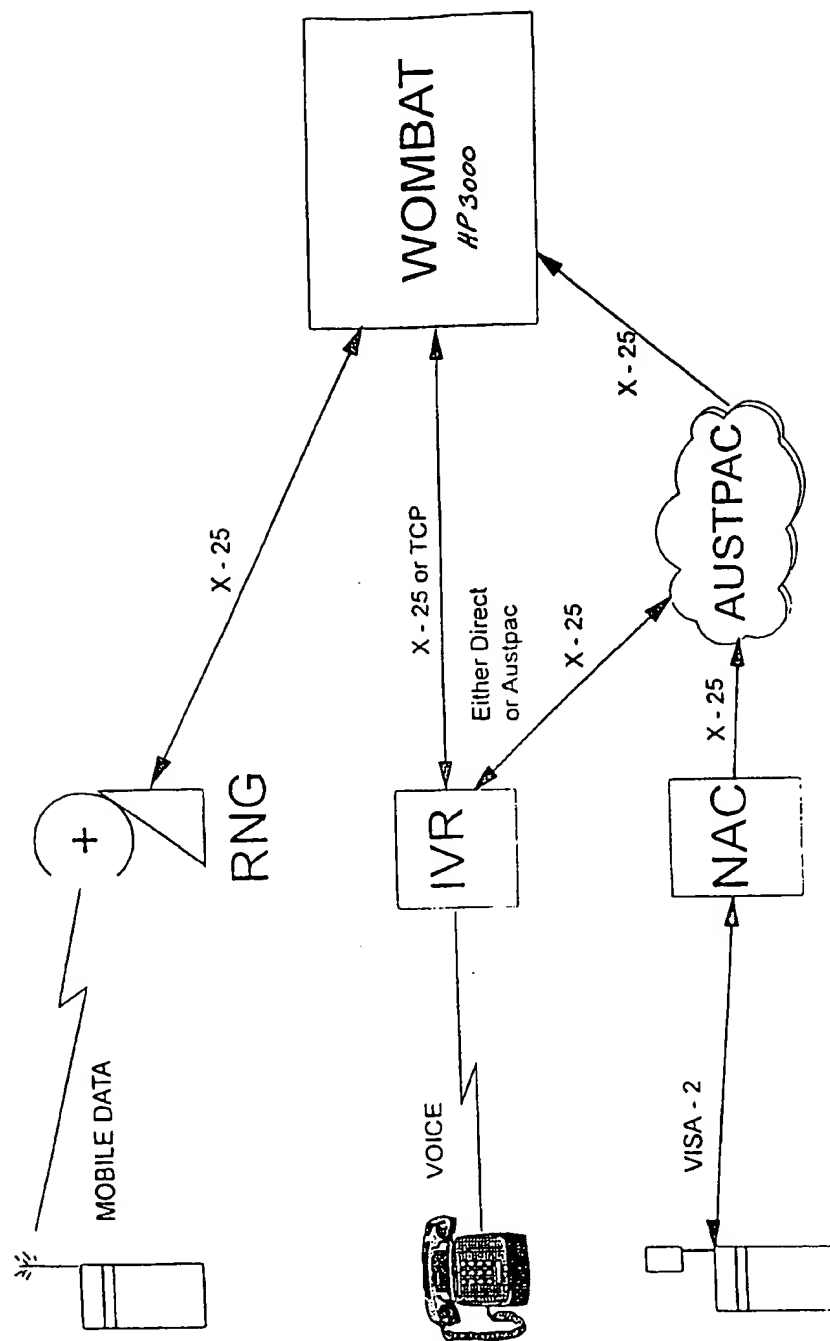


Fig. 5

FIG. 6

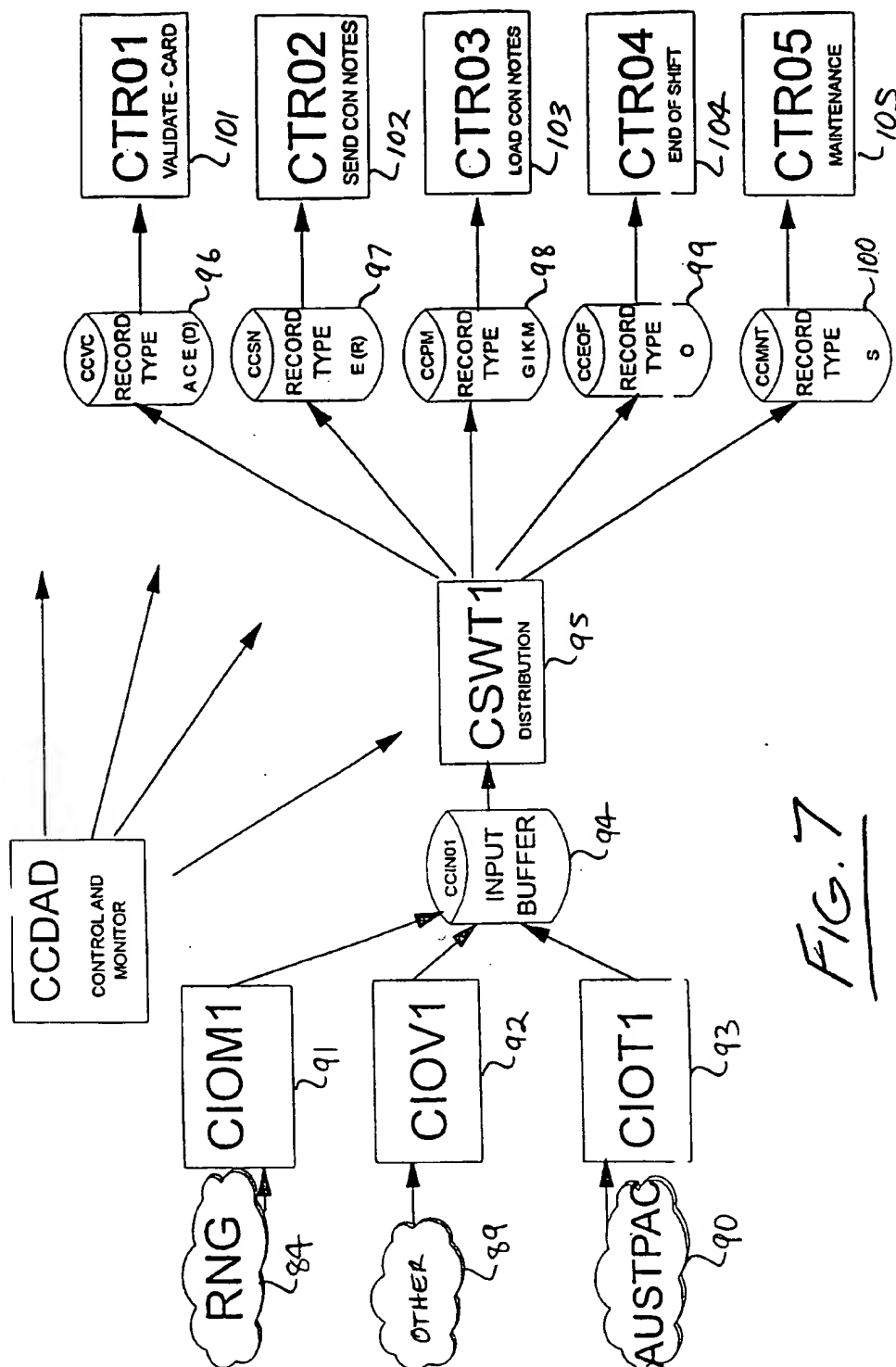


FIG. 7

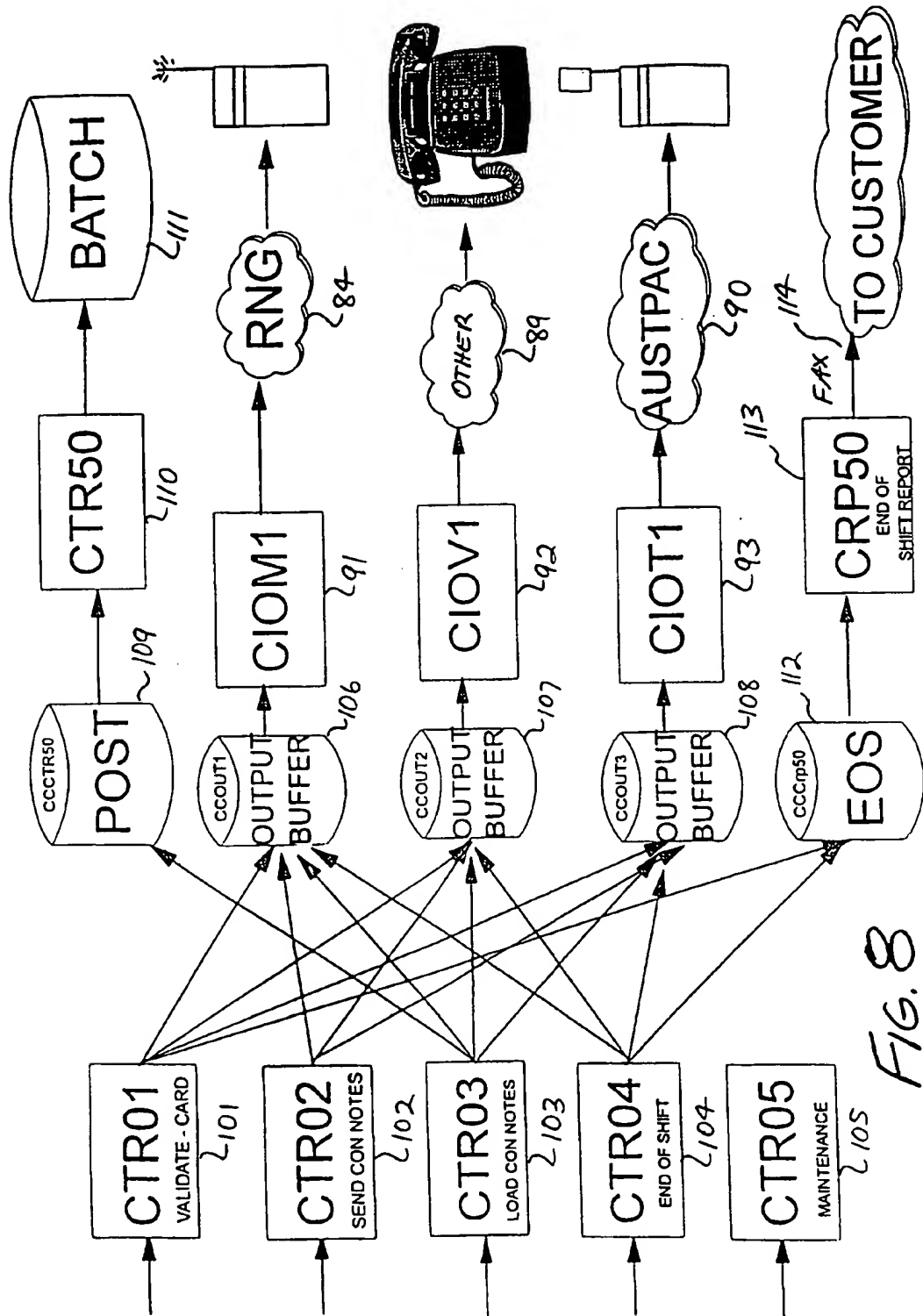
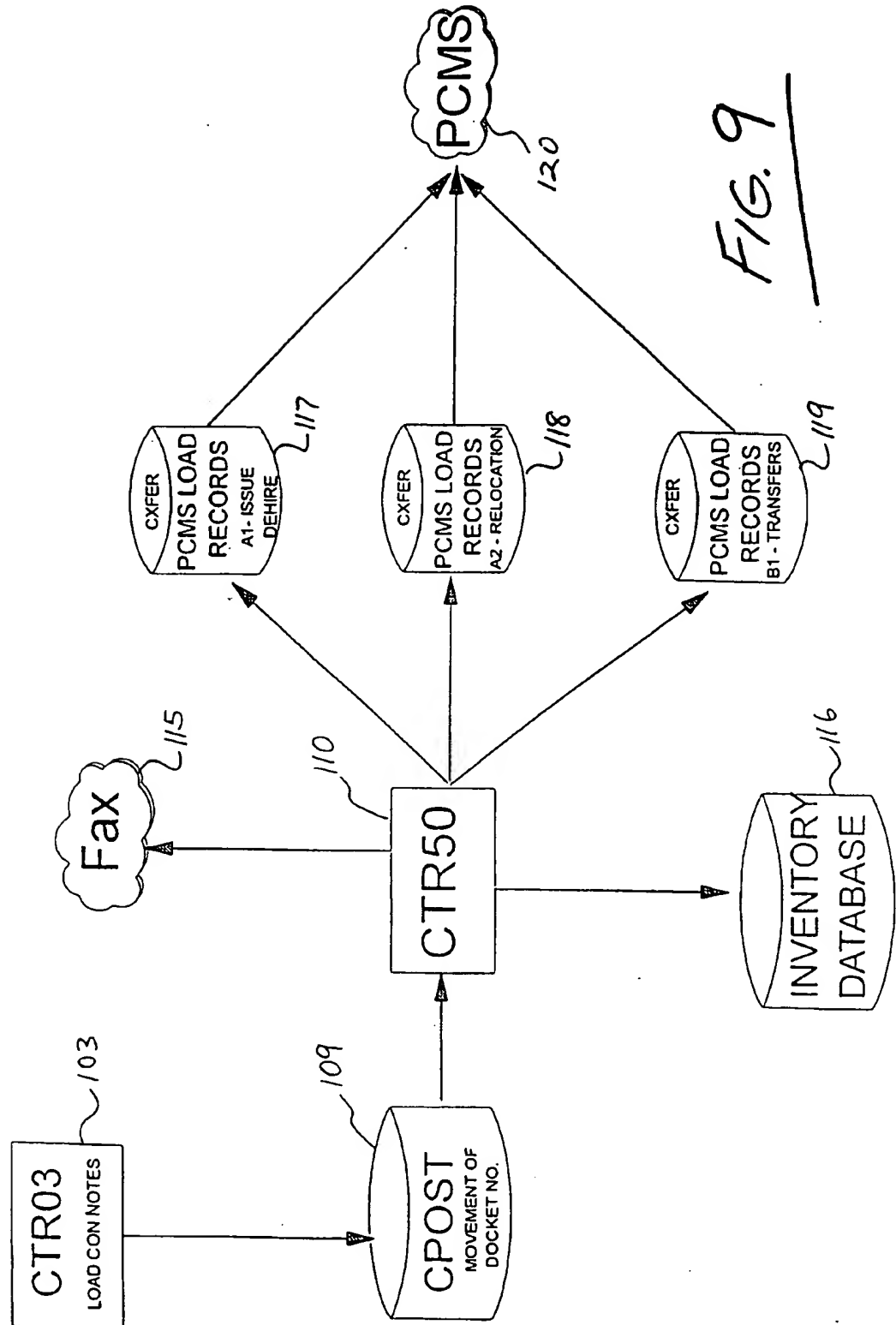


FIG. 8



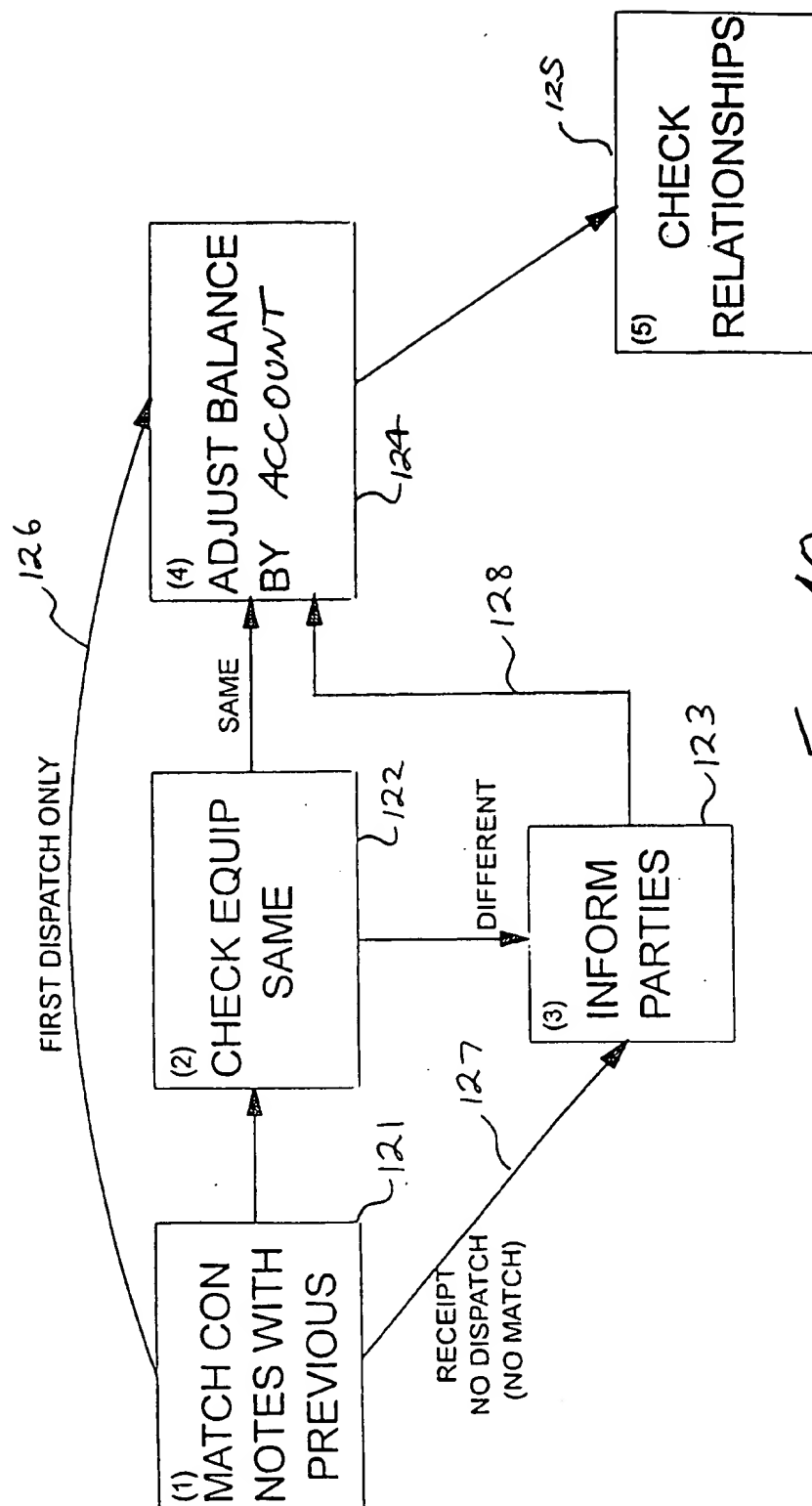


Fig. 10



# INTERNATIONAL SEARCH REPORT

International Application No.  
PCT/AU 97/00594

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
Int Cl <sup>B</sup> : G06F 17/60		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) IPC : G06F 17/60, 153:00, G06F 15/24		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU : IPC AS ABOVE		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WPAT : LEASE# OR LEASING, HIRE# OR HIRING, RENT., TRAC: OR MONITOR:		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2212310 A (STEP BY STEP CONSULTANTS LIMITED) 19 July 1989 pages 1-6	1, 5
A	AU 80973/94 A (THE GENERAL HOSPITAL CORPORATION) 11 May 1995 abstract	
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Date of the actual completion of the international search 20 October 1997		Date of mailing of the international search report <b>24 OCT 1997</b>
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929		Authorized officer  <b>J.W. THOMSON</b> Telephone No.: (02) 6283 2214

## INTERNATIONAL SEARCH REPORT

International Application No.

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
AU	80973/94	CA	2152276	EP	685090	JP	8508359
		US	5434775	WO	9512858		

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